Original article

Prevalence of HIV-1 among attenders at sexually transmitted disease clinics: analyses according to country of birth

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Objectives: To determine the importance of world region of birth as a risk factor for HIV-1 infection, the likelihood of having an HIV-1 infection diagnosed and the likelihood of having another coexisting acute sexually transmitted infection (STI) among attenders at genitourinary medicine clinics.
Subjects: Specimens from attenders having routine syphilis serology at 15 sexually transmitted disease clinics in England, Wales, and Northern Ireland participating in the unlinked anonymous seroprevalence monitoring programme from 1994 to 1996.
Methods: Limited data were collected with specimens that were irreversibly unlinked from the source patients before testing for antibodies to HIV-1. Numbers of specimens, the prevalence of HIV-1, the proportions of infections clinically diagnosed, and the presence of coexisting acute STIs were analysed according to world region of birth, sexual orientation, and injecting drug use.
Results: Between 1994 and 1996, 173 075 specimens were collected; 16.9% were from people born outside the United Kingdom. Risk of being HIV-1 positive was significantly higher overall for both men and women born abroad, but this was not the case for those born in south Asia (India, Pakistan, and Bangladesh). Homosexual and bisexual males born abroad were almost twice as likely to be HIV infected as their counterparts born in the United Kingdom. However, homosexual and bisexual men born in the United Kingdom accounted for almost three quarters of the 1174 HIV-1 positive specimens detected. Among 158 728 non-drug injecting heterosexuals the highest prevalence was observed in specimens from those men (4.0%) and women (5.8%) born in sub-Saharan Africa. The 6991 heterosexual men and women born in other European countries were also more likely to provide HIV-1 positive specimens than UK born heterosexuals. However, 39% of the HIV-1 positive specimens in heterosexuals come from clinic attenders born in the United Kingdom. Heterosexual males were generally less likely to have their infection diagnosed than females. There were 182 attendances (mostly from London clinics) non-drug injecting heterosexual men and women who were infected with both HIV-1 and an acute sexually transmitted infection; only 12% of whom had had their HIV-1 infection diagnosed.
Conclusion: Among most people attending genitourinary medicine clinics, being born abroad is associated with an increased likelihood for HIV-1 infection. HIV-1 infected heterosexuals, of whom 46% are people from sub-Saharan Africa, are unlikely to have their infection clinically diagnosed and thus are unable to obtain appropriate treatment. The presence of HIV-1 infected heterosexual men and women with acute STI represents a potential source of heterosexual HIV transmission both for those born in the United Kingdom and born abroad.
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Keywords: HIV; country of birth; STD clinic attenders; unlinked anonymous surveillance

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Introduction

Infection with human immunodeficiency virus type 1 (HIV-1), in common with other sexually transmitted infections (STIs), is distributed heterogeneously in populations in the United Kingdom.[1] The virus with its associated spectrum of disease has spread rapidly in a number of developing and developed countries since the first recognition of AIDS 15 years ago.[2] High levels of transmission have already occurred in parts of sub-Saharan Africa, South East Asia, the Americas, and southern Europe,[2] and recently rapid spread has been recorded in parts of the Indian subcontinent (south Asia) and eastern Europe.[2 3] The British population is richly international; around 9% of the young adult population were born abroad and people living in the United Kingdom make over 12 million trips abroad annually.[4 5] Exposure abroad in countries where the prevalence of infection is high is recognised as a risk factor for HIV-1 infection.[1 6] Many countries where HIV is now endemic have important historical links with the United Kingdom through its colonial past, Commonwealth countries in sub-Saharan Africa, the Indian subcontinent, and the Caribbean contain around 60% of prevalent HIV worldwide.[2] Equally, neighbouring countries in Europe such as France, Italy, and Spain have prevalences of HIV which are threefold to sixfold higher than that of the United Kingdom.[2] Population movement for holidays, business, or domicile between both types of country and the United Kingdom is commonplace.[5] Both ethnic origin and country of birth are very relevant in investigating the contribution of infections acquired abroad.

Data gathered from the results of voluntary confidential HIV testing provide important

Table 1 Survey of genitourinary medicine clinic attenders: HIV-1 prevalence by world region of birth and sex, 1994–6

	UK	*Rest of Europe*	*Sub-Saharan Africa*	*Caribbean*	*Australasia*	*North Africa and Middle East*	*Central and South America*	*South Asia*	*North America*	*East and South East Asia*	*Total**
Males:											
Total	74 930	3552	3427	2294	1048	1456	698	951	631	523	89 510
HIV-1 Pos	1050	175	153	21	42	14	52	4	37	21	1569
% Positive	1.40	4.93	4.46	0.92	4.01	0.96	7.45	0.42	5.86	4.02	1.75
Females:											
Total	68 826	4541	3293	1841	1517	779	829	543	691	705	83 565
HIV-1 Pos	95	36	189	7	3	2	6	0	2	3	343
% Positive	0.14	0.79	5.74	0.38	0.20	0.26	0.72	0.00	0.29	0.43	0.41
All (total)*											
Total	143 756	8093	6720	4135	2565	2235	1527	1494	1322	1228	173 075
HIV-1 Pos	1145	211	342	28	45	16	58	4	39	24	1912
% Positive	0.80	2.61	5.09	0.68	1.75	0.72	3.80	0.27	2.95	1.95	1.10

* Excludes 934 specimens where sex was not recorded and 26 799 where country of birth was not recorded.

insights into the burden of infection experienced in the United Kingdom in individuals who acquired their infection elsewhere, including those born abroad.[7] However, this source of information can only apply to those seeking or being offered HIV testing.[6] Evidence shows that people originating in developing countries may be especially unlikely to seek, or be offered, diagnostic HIV testing[8] and that therefore the unlinked anonymous approach based on specimens gathered routinely will be particularly useful in contributing to the surveillance of these groups.[6]

Methods

An unlinked anonymous HIV survey involving patients attending genitourinary medicine (GUM) clinics was initiated in England, Wales, and Northern Ireland from 1990.[6 9] The survey expanded to include 15 clinics in 1994. In each clinic it is routine practice to perform diagnostic syphilis serology on all patients attending for a new episode relating to a new risk of sexually transmitted infection (STI). Individuals presenting for the first time within a calendar quarter are eligible for the survey and the residue of their syphilis specimen, after completion of diagnostic testing, is collected for HIV testing. A limited set of epidemiological and clinical data were retained with the specimen including sexual orientation, sex, drug injecting behaviour, whether the subject had had HIV infection diagnosed, and whether they had an acute STI at the time of consultation.[9] Concurrent acute STI was recorded if one or more of the following diagnoses were made at the time of specimen collection. The category "acute STI" included infectious syphilis, postpubertal gonorrhoea (uncomplicated and complicated), chancroid, donovanosis, lymphogranuloma venereum, chlamydia (uncomplicated and complicated), non-specific urethritis (NSU), trichomoniasis, scabies/pediculosis, herpes simplex (first attack), wart virus infection (first attack), and molluscum contagiosum. Since 1993, following a recommendation of a Medical Research Council overview committee, country of birth (when available) has been included in the data retained.[6]

Data reviewed here were for the 3 year period 1994–6. Clinics introduced the collection of country of birth at different times over the study period, so that there were a substantial number of specimens in 1994 for which country of birth information was unavailable (Table 1).[6]

After irreversible unlinking from patient identifiers, residual sera were tested using conventional enzyme immunoassays (EIAs) for HIV. All initially reactive specimens were tested and infections confirmed in the Virus Reference Division of the Central Public Health Laboratory, Colindale, using the currently standard test algorithm.[6]

Before analysis, data from individual clinics were combined and information on specific countries of birth was reduced to 10 world geographic regions (Table 1). Prevalence of anti-HIV-1 (referred to as HIV-1) was determined among all patients, and then stratified by sex and sexual orientation; (homosexual and bisexual males, heterosexual males and females, excluding those known to have injected drugs) and according to world region of birth. Comparisons of HIV-1 prevalence were made for the 10 regions of birth according to sex and exposure category. Comparisons were also made for the proportions of HIV-1 positive specimens from people whose HIV-1 infection was known to have been clinically diagnosed and the proportions of those from an individual with an acute STI. All comparisons were made using χ^2 tests in STATA version 5.0.

Results

Between January 1994 and December 1996 results were received for 173 075 specimens where country of birth was recorded. Specimens from people born outside the United Kingdom accounted for 29 319 (16.9%) of this total. The three largest regional categories were the "Rest of Europe" 8093 specimens (4.7%), "Sub-Saharan Africa", 6720 (3.9%), and the "Caribbean" 4135 (2.4%) (Table 1).

Of the 173 075 specimens, 1912 (1.1%) were HIV-1 antibody positive. Although individuals born in the United Kingdom accounted for 59.9% (1145 of 1912) of HIV-1 positive specimens, the proportion positive in this group (1145 of 143 756, 0.8%) was low. HIV-1 positivity was significantly higher in specimens from men and women born abroad overall (odds ratio 3.3; 95% confidence interval 3.0–3.6). The risk of being HIV-1 positive was higher for those born in the rest of Europe, North America, Central and South America, sub-Saharan Africa, East and South East Asia, and Australasia (Table 1). Prevalence was lowest in those born in South Asia. Males were

Table 2 Survey of genitourinary medicine clinic attenders: HIV-1 prevalence by world region of birth and risk group, 1994–6

Exposure category	*UK*	*Rest of Europe*	*Sub-Saharan Africa*	*Caribbean*	*Australasia*	*North Africa and Middle East*	*Central and South America*	*South Asia*	*North America*	*East and South East Asia*	*Total*
Homo/bisexual males:											
Total	9706	902	215	49	260	79	232	59	214	106	11 822
HIV-1 Pos	855	134	27	7	38	12	46	2	34	19	1174
% Positive	8.81	14.86	12.56	14.29	14.62	15.19	19.83	3.39	15.89	17.92	9.93
Male heterosexuals*:											
Total	63 970	2550	3181	2224	761	1363	460	883	404	412	76 208
HIV-1 Pos	181	26	126	14	4	2	6	2	1	2	364
% Positive	0.28	1.02	3.96	0.63	0.53	0.15	1.30	0.23	0.25	0.49	0.48
Female heterosexuals*:											
Total	67 983	4441	3270	1841	1480	773	820	542	671	699	82 520
HIV-1 Pos	86	23	189	7	2	2	6	0	0	3	318
% Positive	0.13	0.52	5.78	0.38	0.14	0.26	0.73	0.00	0.00	0.43	0.39
Other categories:											
Total	2097	200	54	21	64	20	15	10	33	11	2525
HIV-1 Pos	23	28	0	0	1	0	0	0	4	0	56
% Positive	1.10	14.00	0.00	0.00	1.56	0.00	0.00	0.00	12.12	0.00	2.22
All exposure categories†:											
Total	143 756	8093	6720	4135	2565	2235	1527	1494	1322	1228	173 075
HIV-1 Pos	1145	211	342	28	45	16	58	4	39	24	1912
% Positive	0.80	2.61	5.09	0.68	1.75	0.72	3.80	0.27	2.95	1.95	1.10

* Excludes those where drug injecting was recorded.
† Excludes 934 specimens where sex was not recorded and 26 799 where country of birth was not recorded.

more likely to be infected than females overall (odds ratio 4.3; 95% confidence interval 3.9–4.9) (Table 1). Except for south Asia and sub-Saharan Africa specimens, those from males were significantly more likely to be HIV-1 positive than those from females for every geographic region (Table 1). For those in the "South Asia" category there was no evidence of a difference in HIV-1 prevalence between men and women and in the "Sub-Saharan Africa" category men were significantly less likely to be HIV-1 infected then women (odds ratio 0.77; 95% confidence interval 0.62–0.95). After stratification by sexual orientation (Table 2), much, but not all of the excess of infection in males was explained by the importance of sex between men as a risk factor for HIV-1 infection in males.

HIV RISK GROUPS

Homosexual and bisexual men

In this risk group overall HIV-1 prevalence was 15.1% (319 of 2116) among homosexual and bisexual men born abroad and was 8.8% (855 of 9706) in men born in the United Kingdom (Table 2). HIV-1 prevalence was higher for those in all world regions of birth apart from south Asia than it was in men born in the United Kingdom (Table 3). Homosexual or bisexual men born in the United Kingdom contributed 72.8% (855 of 1174) of HIV-1 positive specimens in this exposure category and 44.7% (855 of 1912) of all HIV-1 positive specimens detected (Table 2).

Table 3 Survey of genitourinary medicine clinic attenders: comparison of HIV-1 prevalence between UK born clinic attenders and attenders from other world regions of birth

Exposure category	*World region of birth*	*Odds ratio*	*(95% Confidence interval)*
Homosexual and bisexual men	UK	1	
	Rest of Europe	1.81	(1.48–2.20)
	Caribbean	1.73	(0.79–3.78)
	Sub-Saharan Africa	1.49	(0.99–2.23)
	South Asia	0.36	(0–1.35)
	Born abroad	1.84	(1.60–2.11)
Heterosexual men	UK	1	
	Rest of Europe	3.63	(2.41–5.47)
	Caribbean	2.23	(1.30–3.83)
	Sub-Saharan Africa	14.54	(11.55–18.29)
	South Asia	0.8	(0–2.94)
	Born abroad	5.35	(4.35–6.57)
Heterosexual women	UK	1	
	Rest of Europe	4.11	(2.60–6.49)
	Caribbean	3.01	(1.42–6.40)
	Sub-Saharan Africa	48.43	(37.46–62.61)
	South Asia	0	—
	Born abroad	12.8	(10.00–16.40)

Heterosexual men and women

Among heterosexual men and women where drug injecting was not recorded as a risk factor, those born in the United Kingdom, contributed 83.1% (131 953 of 158 728) of the total specimens included but only contributed 39.1% (267 of 682) of HIV-1 positive specimens (Table 2). HIV-1 prevalence was highest among heterosexual men (4.0%) and women (5.8%) born in sub-Saharan Africa. These prevalences were 14 times higher than those in men (0.3%) and 48 times higher in women (0.1%) born in the United Kingdom (Table 3). Heterosexual men and women born in the rest of Europe also had a significantly higher HIV-1 prevalence than those born in the United Kingdom (Table 3), as did those born in the Caribbean (Table 3). Prevalence was very low among the relatively small number of non-injecting heterosexual men and women from south Asia. The region of birth sub-Saharan Africa accounted for 46.2% (315 of 682) of HIV-1 positive specimens detected from heterosexuals.

Injecting drug users

There were 1572 specimens from individuals for whom drug injecting had been recorded. Of these 44 (2.8%) were HIV-1 positive (data not shown). Seventeen of the 44 were from injecting drug users (IDU) born in the United Kingdom (HIV-1 prevalence of 1.3%). Twenty four of the 147 specimens (16.3%) from individuals born in the rest of Europe were HIV-1 positive.

DIAGNOSED AND UNDIAGNOSED HIV INFECTIONS

Overall, 60.1% (763 of 1912) of HIV-1 positive specimens were from people whose infections had been diagnosed. This proportion differed by global region of birth (Table 4). Overall,

Table 4 Survey of genitourinary medicine clinic attenders 1994–6: diagnosed and undiagnosed HIV infections by region of birth and exposure category

Exposure category	UK	Rest of Europe	Sub-Saharan Africa	Caribbean	Australasia	North Africa and Middle East	Central and South America	South Asia	North America	East and South East Asia	Total
Homo/bisexual males:											
No diagnosed	593	101	17	3	29	9	32	1	22	11	818
Total HIV pos	855	134	27	7	38	12	46	2	34	19	1174
% Diagnosed	69.36	75.37	62.96	42.86	76.32	75.00	69.57	50.00	64.71	57.89	69.68
Male heterosexuals*:											
No diagnosed	67	10	49	3	2	2	2	1	0	1	137
Total HIV pos	181	26	126	14	4	2	6	2	1	2	364
% Diagnosed	37.02	38.46	38.89	21.43	50.00	100.00	33.33	50.00	0.00	50.00	37.64
Female heterosexuals*:											
No diagnosed	40	15	87	3	1	1	2	0	0	2	151
Total HIV pos	86	23	189	7	2	2	6	0	0	3	318
% Diagnosed	46.51	65.22	46.03	42.86	50.00	50.00	33.33	—	—	66.67	47.48
Other categories†:											
No diagnosed	16	23	0	0	1	0	0	0	3	0	43
Total HIV pos	23	28	0	0	1	0	0	0	4	0	56
% Diagnosed	69.57	82.14	—	—	100.00	—	—	—	75.00	—	76.79
All exposure categories:											
No diagnosed	716	149	153	9	33	12	36	2	25	14	1149
Total HIV pos	1145	211	342	28	45	16	58	4	39	24	1912
% Diagnosed	62.53	70.62	44.74	32.14	73.33	75.00	62.07	50.00	64.10	58.33	60.09

* Excludes those where drug injecting was recorded.
† Includes injecting drug users and specimens where sexual orientation was not recorded.

males were more likely to have had their infection diagnosed than females (odds ratio 1.6; 95% confidence interval 1.2–2.0) but this was mostly accounted for by the higher diagnosis rate in those recorded as homosexual and bisexual (Table 4). In total, 30.6% (356 of 1174) of HIV-1 positive specimens from homosexual or bisexual men were from patients whose infection had not been diagnosed (Table 4). There was no difference in the proportion diagnosed for homosexual and bisexual men born abroad compared with those born in the United Kingdom (p=0.7216). Thirty seven per cent (67 of 181) of infections among non-injecting male heterosexuals born in the United Kingdom had been diagnosed and 46.5% (40 of 86) of females (Table 4). The proportion of HIV infections diagnosed were similar for non-injecting heterosexual men and women born in the rest of Europe, the Caribbean, and sub-Saharan Africa (Table 4). Of the 44 HIV-1 positive specimens among people reporting drug use, six were from people whose infection remained undiagnosed. Five out of the six of these specimens were from male injectors.

Table 5 Survey of genitourinary medicine clinic attenders by exposure category, sexually transmitted infection status, percentage diagnosed, and world region of birth, 1994–6

Exposure category	Sexually transmitted infection status	World region of birth: UK	Sub-Saharan Africa	Rest†	Total
Homosexual and bisexual males	Acute STI				
	Total tested	2615	55	493	3163
	HIV-1 positive	216	2	66	284
	% diagnosed	42	0	48	43
	Prevalence (%)	8.26	3.64	13.39	8.98
	Non-acute				
	Total tested	7091	160	1408	8659
	HIV-1 positive	639	25	226	890
	% diagnosed	79	68	78	78
	Prevalence (%)	9.01	15.63	16.05	1.10
Male heterosexuals*	Acute STI				
	Total tested	25 765	1313	3328	30 406
	HIV-1 positive	60	35	19	114
	% diagnosed	12	9	16	11
	Prevalence (%)	0.23	2.67	0.57	0.37
	Non-acute				
	Total tested	38 205	1868	5729	45 802
	HIV-1 positive	121	91	38	250
	% diagnosed	50	51	47	50
	Prevalence (%)	0.32	4.87	0.66	1.10
Female heterosexuals*	Acute STI				
	Total tested	18 698	672	2076	21 446
	HIV-1 positive	20	39	9	68
	% diagnosed	20	8	22	13
	Prevalence (%)	0.11	80	0.43	0.32
	Non-acute				
	Total tested	49 285	2598	9191	61 074
	HIV-1 positive	66	150	34	250
	% diagnosed	55	56	65	57
	Prevalence (%)	0.13	77	0.37	0.41

* Excludes those known to inject drugs.
† Excludes 26 131 specimens with country of birth not recorded.

ACUTE SEXUALLY TRANSMITTED INFECTIONS AT TIME OF SPECIMEN COLLECTION

There were 55 015 specimens from people presenting with an acute STI, of which 3163 were from homosexual or bisexual males and 51 852 from non-injecting heterosexuals. Two hundred and eighty four of the 3163 (9.0%) specimens from homosexual and bisexual males were HIV-1 infected (Table 5). Forty three per cent (122) of the 284 HIV-1 positive men with an acute STI had their HIV-1 infection clinically diagnosed while 162 (57.0%) seemingly remained undiagnosed at the end of the consultation (Table 5). When considered by region of birth, HIV-1 prevalence among homosexual and bisexual males with an acute STI who were born in the rest of Europe was 12.9%; (30 of 232), higher than for males born in the United Kingdom (8.3%; 216 of 2615) (odds ratio 1.5; 95% confidence interval 1.1–2.3). There was, however, no difference in the likelihood of their HIV infection having being diagnosed. One hundred and eighty two of the 55 015 (0.3%) specimens with acute STI from heterosexuals were also infected with HIV-1 (Table 5). Eighty four per cent (153 of 182) of these cases were among people attending London clinics. Eighty cases of combined HIV-1 and acute STI infections were found among the 131 953 specimens from heterosexual men and women born in the United Kingdom and 74 among the 6451 specimens from men and women born in sub-Saharan Africa (Table 5). Only 22 of 182 (12.1%) of the HIV-1 infections in men and women with acute STIs were diagnosed (Table 5). The proportions were similar for those born in the United

Kingdom, 13.8% (11 of 80) and men and women born in sub-Saharan Africa 8.1% (six of 74).

Discussion

Although the majority of GUM clinic attenders whose specimens contributed to this survey were born in the United Kingdom, a considerable number were collected from people who were born abroad. The proportions of attenders born abroad (17%) is higher than the proportion of young adult population recorded as born outside the United Kingdom in the 1991 census (7%).[4] This is not unexpected as a number of the source countries carry a higher burden of STIs than the United Kingdom.[2] The findings demonstrate that country of birth is strongly associated with HIV-1 infection in GUM clinic attenders. This has been noticed in at least two other countries.[10 11] Homosexual and bisexual males born abroad have higher HIV infection rates than those born in the United Kingdom. Among heterosexual men and women, in addition to the well known association with time spent in sub-Saharan Africa,[1 12] being born in other parts of Europe, Central and South America, and the Caribbean was associated with increased likelihood of HIV infection. It is disquieting that the proportions of infections that are diagnosed among heterosexuals were so low (Table 4). This suggests that diagnostic as well as health promotion services need to be targeted towards heterosexuals. All these findings will further inform HIV testing strategies in GUM clinics though care must be taken not to stigmatise or blame those born abroad. Country of birth must not be confused with ethnic group[13] and there will have been specimens in the survey from individuals of black and Asian ethnicity who were born in the United Kingdom and therefore included in this category, just as there probably have been people of south Asian ethnicity born in sub-Saharan Africa. As ethnicity was not recorded, this survey cannot give information about levels of HIV infection among black Africans and black Caribbeans born in the United Kingdom who attended GUM clinics. These are groups whose members may be at increased risk of acquiring HIV infection through sex between men and women.[14] Gathering ethnic group data within the unlinked surveys would clearly be desirable if comparability and consistency in ethnic group coding between clinics could be assumed.[13 15] The difference in HIV prevalence between heterosexuals born in sub-Saharan Africa and the United Kingdom supports other information emphasising the importance of the epidemic in sub-Saharan Africa to the UK[5 11] No evidence was found here that transmissions occurring in south Asia have yet had similar impact. However, while the unlinked anonymous methodology minimises participation bias within its setting,[6] it is possible that people born in south Asia are less likely than people born in other world regions to seek treatment at STI clinics. The number of specimens in this survey from people born in south Asia is disproportionately low compared with the number of people born in south Asia recorded as living in the United Kingdom in the 1991 census.[4] This may, of course, simply reflect a low burden of STIs, including HIV, within this group. However, the global epidemics of HIV are also changing, with continuing intensification in India, southern Africa, Eastern Europe, and perhaps other regions.[2] This indicates a need for continuing surveillance and for finer definitions—for example, looking at different regions of sub-Saharan Africa (east, west, and southern Africa) as the United Kingdom pattern of HIV among people born abroad is very likely to change.

It has been demonstrated that the presence of acute STIs, particularly ones producing ulcerative conditions, will facilitate heterosexual transmission of HIV.[16] Hence, the data on co-infection with HIV and an acute STI infection indicates substantial biological and behavioural potential for in-country HIV transmission. This was true both for people born abroad and in the United Kingdom. It is of concern that 88% of these HIV infections (89% in male and 87% in female heterosexuals) remained undiagnosed indicating both a failure of diagnostic testing services and the likelihood of ongoing risk of HIV transmission.

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Collaborative group

The members of the survey group from 15 clinics and associated laboratories comprised: BS Azadian, FC Boag, P Carey, C Carne, D Carrington, E Claydon, P V Coyle, F Davidson, I Farrell, G Kinghorn, G Kudesia, R Maw, D Mercey, PR Mortimer, J Munro, S Murphy, K Mutton, M Nathan, L Neville, A Pozniak, JDC Ross, N Sankar, G Scott, MS Shafi, S Skidmore, R Sparks, A Turner, A Wade, P Watkins, T Wreghitt, and M Zuckerman.

Contributors: Christine McGarrigle coordinated the Public Health Laboratory Service unlinked anonymous survey of GUM clinic attenders from mid-1996 onwards, assembled data for the paper, and undertook the analyses and writing of the paper. Angus Nicoll contributed to analyses and writing of the paper, and managed the GUM survey from 1991 to 1997.

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